Westinghouse Electric Company
Nuclear Power Plants
P.O. Box 355
Pittsburgh, Pennsylvania 15230-0355
USA

U.S. Nuclear Regulatory Commission
ATTENTION: Document Control Desk
Washington, D.C. 20555

Direct tel: 412-374-6206
Direct fax: 412-374-5005
e-mail: sisk1rb@westinghouse.com

Your ref: Docket No. 52-006
Our ref: DCP/NRC2391

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Subject: AP1000 Responses to Requests for Additional Information (SRP3)

Westinghouse is submitting responses to the NRC request for additional information (RAI) on SRP Section 3. These RAI responses are submitted in support of the AP1000 Design Certification Amendment Application (Docket No. 52-006). The information included in the responses is generic and is expected to apply to all COL applications referencing the AP1000 Design Certification and the AP1000 Design Certification Amendment Application.

Enclosure 1 provides the response for the following RAIs:

RAI-SRP3.8.3-SEB1-04
RAI-SRP3.8.3-SEB1-06

Questions or requests for additional information related to the content and preparation of this response should be directed to Westinghouse. Please send copies of such questions or requests to the prospective applicants for combined licenses referencing the AP1000 Design Certification. A representative for each applicant is included on the cc: list of this letter.

Very truly yours,

D. A. Lindgren

Robert Sisk, Manager
Licensing and Customer Interface
Regulatory Affairs and Standardization

/Enclosure

1. Response to Request for Additional Information on SRP Section 3

D063
NRO

cc:	D. Jaffe	-	U.S. NRC	1E
	E. McKenna	-	U.S. NRC	1E
	B. Gleaves	-	U.S. NRC	1E
	C. Proctor	-	U.S. NRC	1E
	T. Spink	-	TVA	1E
	P. Hastings	-	Duke Power	1E
	R. Kitchen	-	Progress Energy	1E
	A. Monroe	-	SCANA	1E
	P. Jacobs	-	Florida Power & Light	1E
	C. Pierce	-	Southern Company	1E
	E. Schmiech	-	Westinghouse	1E
	G. Zinke	-	NuStart/Entergy	1E
	R. Grumbir	-	NuStart	1E
	D. Lindgren	-	Westinghouse	1E

ENCLOSURE 1

Response to Request for Additional Information on SRP Section 3

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP3.8.3-SEB1-04
Revision: 0

Question:

Due to design changes, extension of the AP1000 design to soil sites, reanalysis for updated seismic spectra, and updates made to some critical sections, Westinghouse is requested to address a concern with the design details of the structural module connections to the reinforced concrete basemat. Section 3.8.3.5.3 of the DCD indicates that the steel plate modules are anchored to the reinforced concrete basemat by mechanical connections welded to the steel plate or by lap splices where the reinforcement overlays shear studs on the steel plate. Typical details of these two options are shown on DCD Figure 3.8.3-8, sheets 1 and 2. Westinghouse is requested to address the following two items:

1. The left side of Figure 3.8.3-8, sheet 2, shows that the mechanical connectors that are welded to a ¾ inch plate at the base of the module is identified as "CONT" (presumably meaning continuous) on one side of the module and on the other side the term "CONT" is struck out. Explain which detail is correct and revise the figure accordingly. Were the design detail calculations completed for this connection? Explain how the large loads coming from the CIS wall modules can be properly transferred from the module wall plate at a localized point to the embedded connectors.

2. The right side of Figure 3.8.3-8, sheet 2 shows #11 at 10 inch spacing span from the embedded basemat region into the wall module with about 3 inches of concrete cover. Since this type of connection is not addressed in ACI 349, describe how the loads from the module can be properly transferred from the module to the embedded bars in the basemat and how the design will be performed. When this detail was discussed with Westinghouse at an earlier audit this year, Westinghouse indicated that they would consider removing this second option.

If your response to this request for additional information will reference Revision 17 to the AP1000 DCD, please provide an exact reference.

Westinghouse Response:

1. The plate at the base of the module does not need to be continuous. The revised typical detail is shown in Figure RAI-SRP-3.8.3-SEB1-04-01 and will be included in the DCD. An alternate version of this detail is used in cases where the trusses are extended into the basemat as shown in RAI-SRP-3.8.3-SEB1-04-02. The vertical dowel bars are placed in two layers. The base plate is stiffened to transfer the loads from the module wall plate to the embedded connectors. The design of the surface plate, base plate, and vertical stiffeners is checked by finite element analysis using the model shown in Figure

RAI-SRP-3.8.3-SEB1-04-03. Tension corresponding to yield is applied to each dowel bar. These design calculations have been completed.

2. The right side of Figure 3.8.3-8, sheet 2 shows a dowel bar adjacent to the surface plate. The design of this type of connection is based on recommendations and test data given in Reference 1. The reference provides a design equation to calculate the strength of the connection based on key parameters such as concrete strength, dowel bar length and spacing, and concrete cover. This detail may be used when loading on the surface plates is within the range of the test data. It is used at the base of the CA05 module inside containment and the CA20 module outside containment where design loads are smaller.

Reference:

1. Tsuda, K, Nakayama, T., Eto, H., Akiyama, K., Shimizi, A., Tanouchi, K, and Aoyama, H., "Experimental Study on Steel Plate Reinforced Concrete Shear Walls with Joint Bars", SMIRT Paper # 1086, August 2001.

Design Control Document (DCD) Revision:

Delete "cont" from left side of DCD Rev 17 Figure 3.8.3-8, sheet 2, as shown corrected in Figure RAI-SRP3.8.3-SEB1-04-01.

PRA Revision:

None

Technical Report (TR) Revision:

None

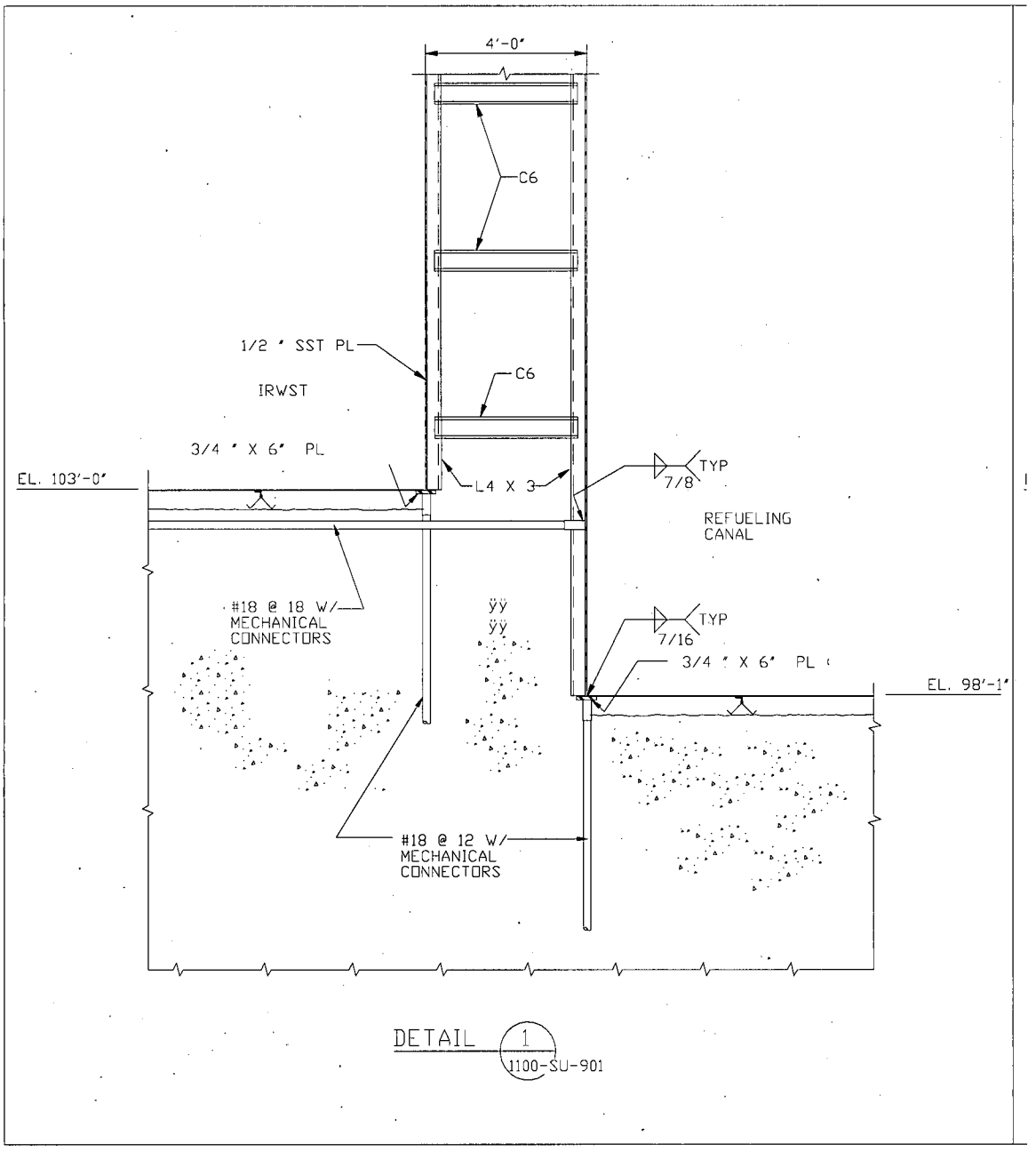

Figure RAI-SRP-3.8.3-SEB1-04-01
Typical detail at base of CA01 Module Wall with single layer of dowel bars

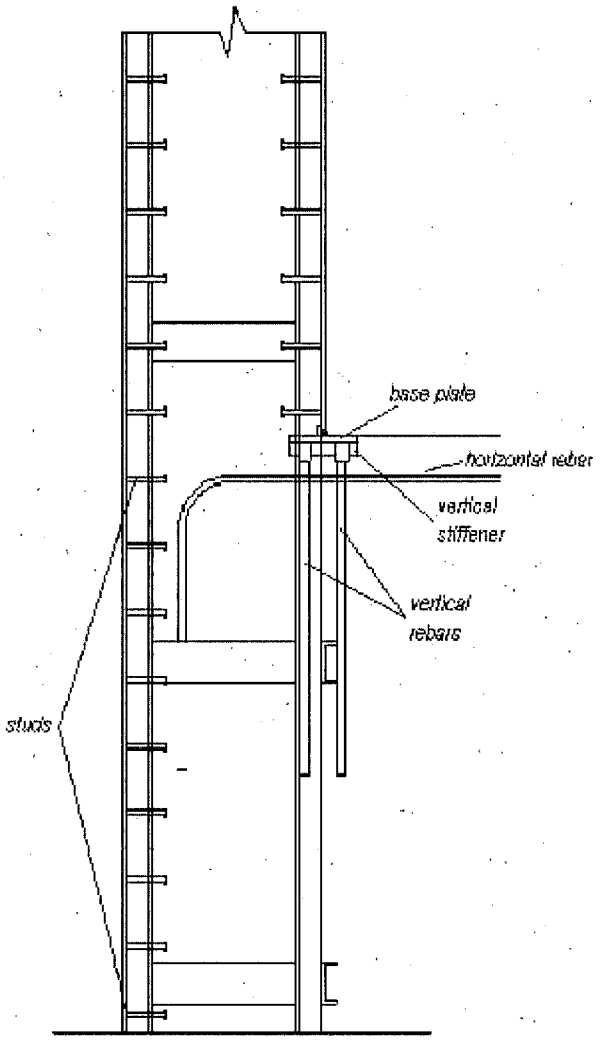

Figure RAI-SRP-3.8.3-SEB1-04-02
Typical detail at base of CA01 Module Wall with double layer of dowel bars

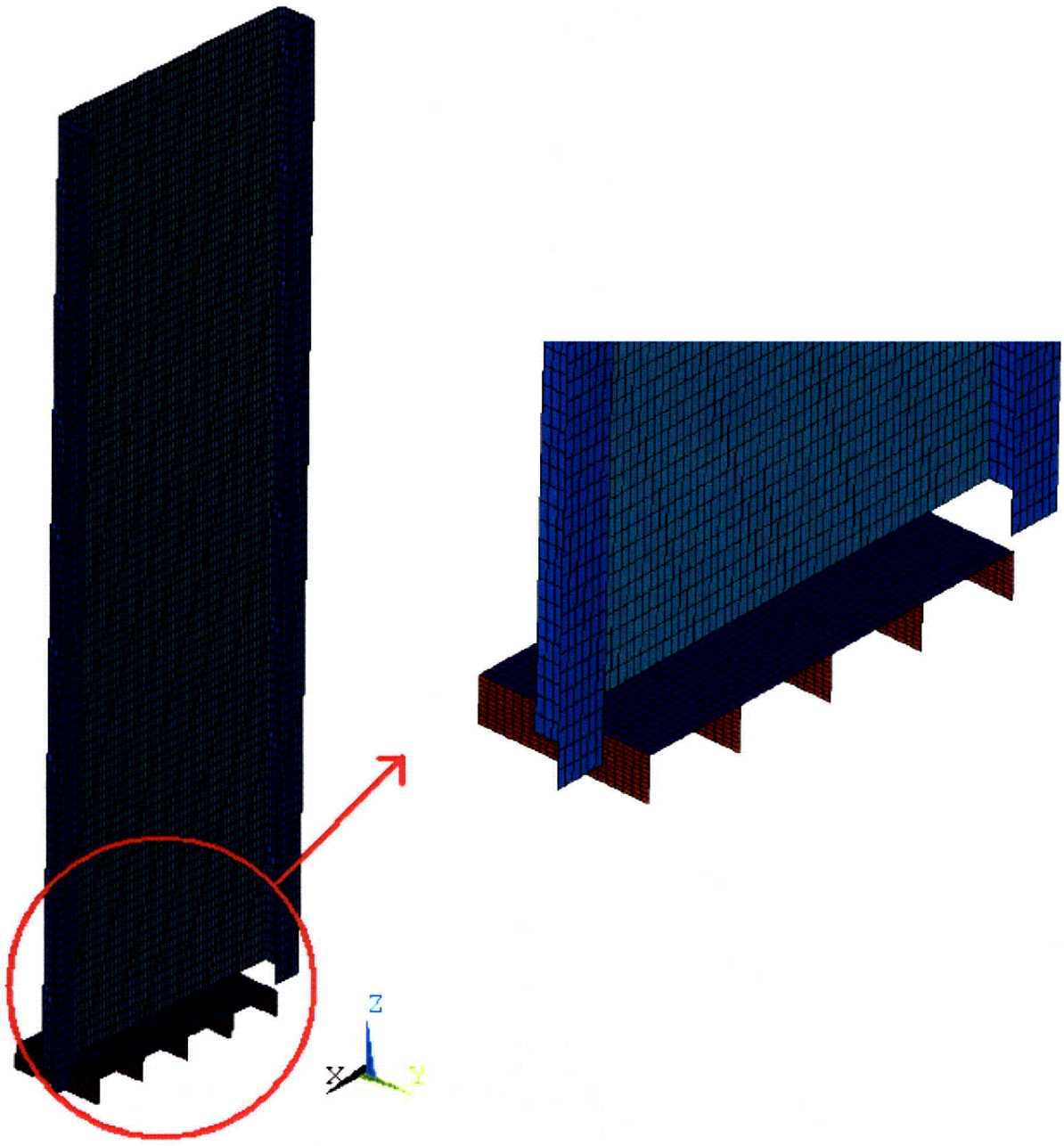

Figure RAI-SRP-3.8.3-SEB1-04-03

AP1000 TECHNICAL REPORT REVIEW

Response to Request For Additional Information (RAI)

RAI Response Number: RAI-SRP3.8.3-SEB1-06
Revision: 0

Question:

DCD Section 3.8.3.6 was revised regarding the use of different steel materials for CIS structural modules. Westinghouse is requested to address the items listed below.

1. The required use of A36 steel plates and shapes for the modules was revised in DCD Rev. 16 to allow the use of carbon steel plates and shapes. Since it is unknown what types of steel material could be used and the analysis and design of the modules assumed certain specific properties (e.g., to meet allowable stresses), Westinghouse is requested to explain why the material designation was revised, identify the specific materials that are considered to be options, and demonstrate that the alternative materials are equivalent to or better than the properties used in the analysis and design of the modules. The specific materials should be included in the DCD.

2. The use of Nitronic 33, ASTM 240, designation S24000, Type XM-29, stainless steel plates for the modules was revised in DCD Rev. 16 to use Duplex 2101 ASTM 240, Designation S32101, stainless steel plates. Westinghouse is requested to explain why this material was revised, how the material properties compare, and demonstrate that the new material properties specified are equivalent to or better than the properties used in the analysis and design of these structures.

If your response to this request for additional information will reference Revision 17 to the AP1000 DCD, please provide an exact reference.

Westinghouse Response:

1. The revisions were made to remove only the text A36 specifically. A36 is a carbon steel and will be used if available. If A36 is not available an equivalent carbon steel may be substituted. In DCD Revision 17, Table 3.8.4-6 lists the materials that are used in Structural and Miscellaneous steel.

2. In Westinghouse Technical Report No. 57 Rev 2, Section 2.1.2, the change from Nitronic 33 steel to Duplex 2101 is described:

> "Duplex 2101 will be used on modules in contact with water in the refueling canal and IRWST. Nitronic 33 was originally intended to meet this application; however, this material is not available in the required plate sizes (1/2" thick x 120" wide). Duplex 2101 is a lean duplex stainless steel designed for general-purpose use. Due to the unique composition of the Duplex 2101, this material provides high strength, excellent resistance to stress corrosion cracking, and economical alternative to 304 or 316L stainless steels. The Duplex 2101 has a yield strength of 65ksi."

Design Control Document (DCD) Revision: None

PRA Revision: None

Technical Report (TR) Revision: None